FRD Activities Report
September 2001

Research Programs

CASES-99

The postprocessing of the LongEZ data from CASES-99 was completed in September. This effort took longer than anticipated because of various timing errors that were present in the raw data. The completed data set has been sent to UCAR in Boulder for inclusion in the CASES-99 archives.

Figure 1 shows an example of vertical profiles obtained during CASES-99. The profile was started right at takeoff, so that it extends from less than 10 m AGL up to over 1000 m AGL. On this night, a shallow layer of mechanically generated turbulence extended up to about 10-20 m. This was capped by an inversion extending to about 60 m AGL. A wind jet of 9 m/s was located near the top of this inversion. A second inversion was present starting at 600-700 m. This is likely the top of the previous day's convective boundary layer. At the time of the profile, this inversion appeared to be producing some turbulence. The region of nearly constant potential temperature between 100 and 600 m is the so-called residual layer. (Richard.Eckman@noaa.gov)

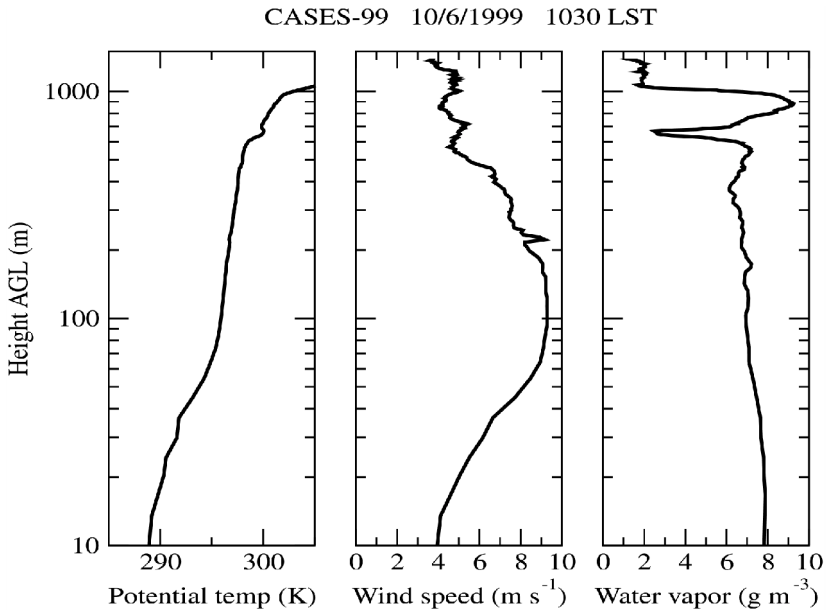

Figure 1. LongEZ profiles from flight on 6 October 1999.

Hurricane Balloon

On September 20, 2001, we performed a launch and recovery of the hurricane balloon from our facility in Idaho Falls. The launch was made to test under actual operating conditions the following balloon functions:

- Satellite Communications
- Altitude Control
- Balloon Termination and Recovery Operations

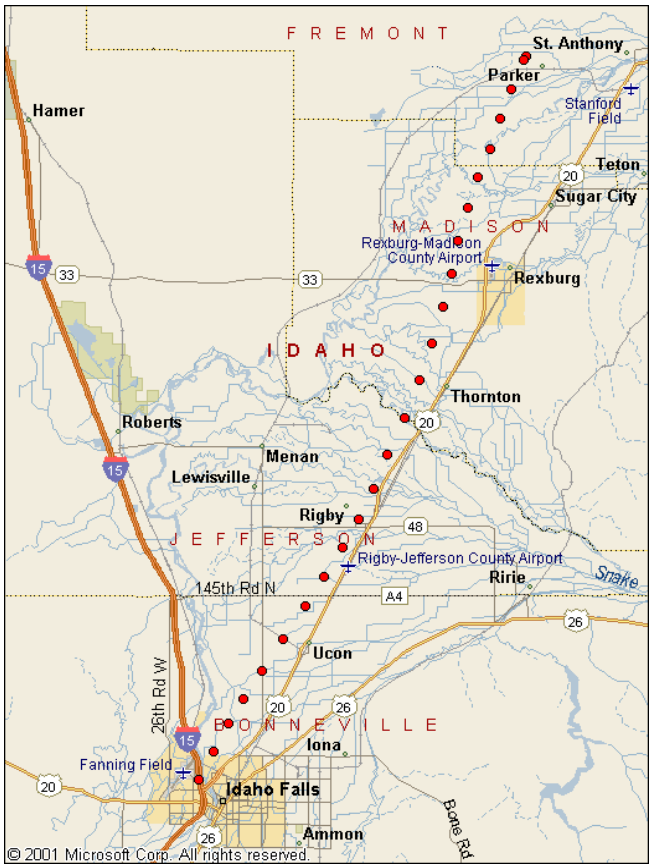

Figure 2. Path of the Hurricane Balloon

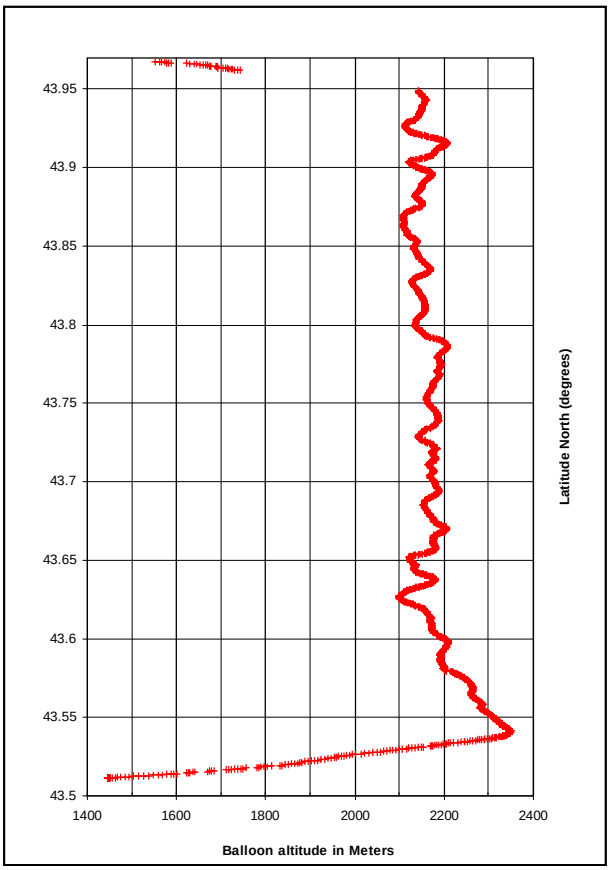

Figure 3. Altitude of the Hurricane Balloon.

In Figure 2, the red dots are spaced at 5 minute intervals showing the path of the balloon over the two-hour flight beginning from our facility near Fanning Field in Idaho Falls and ending in a farm field close to Parker, Idaho, about 35 miles to the northeast. Figure 3 shows the altitude of the balloon in meters as a function of its latitude north (draw a horizontal line to the right of the map in Figure 2 to get the balloon altitude). Notice that the balloon started out from Idaho Falls with about 150 meters excess altitude. Within 15 minutes the ballast pumps adjusted the altitude down below the maximum operating altitude of 2100 meters and maintained this level until the end of the experiment.

The balloon was launched at 11:15 a.m. from the parking lot of our facility. After the balloon launch, we tracked the balloon with a ground vehicle and an aircraft. The redundancy was to ensure that we did not lose track of the expensive balloon and payload. Although we have had extensive lab experience over the past two months, this was the first time the new balloon design with satellite telephone communications was flown. The FAA was notified well in advance of the launch and kept informed of the balloon position and altitude throughout the two-hour flight. After tracking the balloon for about 1.5 hours, map plots indicated that the best chance to recover the balloon and payload would be to terminate the flight near Parker, Idaho. As the balloon approached our recovery vehicle, the command was given to cut down the balloon. The balloon required about five minutes to release the lift gas and come to a soft landing in a nearby field where we recovered it without incident.

Prior to making our first launch, we have also been conducting failure mode tests. We have done over 330 tests to ensure that the balloon cuts down under the following conditions:

- Satellite communications failure
- Transponder microprocessor failure
- Power failure
- Connector or wiring failure
- Exceeding max altitude failure
- GPS position failure

All failure testing resulted in balloon cut down without any exception (100 % successful testing).

CBLAST-Low

Effort this month focused on careful post-processing of the 52 hours of data collected during this summers pilot study in Martha's Vineyard. The post processing algorithms are used to create the final data set which will be disseminated to project PI's. Key elements of the processing routines include replacing the raw GPS data with differentially corrected velocities and positions, blending low frequency velocities and attitudes (from GPS) with higher frequency components from accelerometers, correcting temperature measurements for dynamic heating of the element, calculating winds based on the raw pressure measurements, and careful quality control checks. With the upgrades to the LongEZ data system hardware and software, this data set does not contain many of the timing errors and missing data points that plagued the system in previous experiments. Likewise, much of the post processing effort is being spent on careful calibrations to remove residuals in the wind calculations resulting from dynamic aircraft maneuvers. While this has little effect on the resultant mean wind, it is critical in determining the flux in gusty conditions. (Jeff.French@noaa.gov, Jerry Crescenti, Timothy Crawford)

CBLAST-Hurricane

As the 2001 hurricane season comes to an end, engineers at AOC are beginning work on the installation for the BAT probe and accompanying data system on both NOAA P3 aircraft. P3 #43

will be going in for Depo-Level maintenance over the winter, during which time cables will be run for the system. Planning at this stage is critical as once the aircraft is put back together, we will be unable to change the cabling. Discussion with AOC personnel focused on the placement of the 4 GPS antennae that will be used by the TANS-vector to retrieve aircraft attitude. FRD personnel are in the processing of putting together a block diagram outlining the space, power, and cable requirements for the entire system. Work on the pressure port hemispheres is also nearing completion. We are awaiting guidance from AOC regarding the placement of the pressure ports (based on aircraft attitude at typical flight speeds). Work also continues on assembly and testing of the data system. (Jeff.French@noaa.gov, Timothy Crawford)

URBAN/VTMX 2000

The VTMX experimenters group sponsored a progress and informational meeting this month, which marks one year since the field deployment for the study began. Kirk Clawson presented the progress FRD has made on the project to date, indicating that all data had been analyzed and delivered to the archive, save for the sonic anemometer data. Data delivered to the archive include the SF_6 release, SF_6 bag samples, SF_6 real-time mobile analyzers, radar profiler, SODAR, and surface met station data. Some funding remains from the project to begin a final data report, and pending FY02 funds are expected to enable us to complete the report. These funds will also provide support for planning the next URBAN experiment to be conducted in 2003, probably in Oklahoma City. (Kirk.Clawson@noaa.gov)

AFTAC 2001

AFTAC 2001 was an SF_6 tracer study conducted in April of this year at the Dugway Proving Ground using three mobile SF_6 analyzers at distances up to 80 km from the release site. This month the final report was completed, reviewed for ARL publication as a NOAA Technical Memorandum, printed, and distributed to the sponsor. A data CD-ROM was also distributed with the printed report. This concludes the AFTAC 2001 project, also known as GAUNTLET. (Kirk.Clawson@noaa.gov and staff)

Cooperative Research with INEEL

Emergency Operations Center (EOC)

FRD staff responded to the activation of the Emergency Operations Center (EOC) after the terrorist attacks on New York City and Washington, D. C on September 11, 2001. The INEEL was placed on a heightened level of security. (Jerry.Crescenti, Jeff French, and Neil Hukari).

Several sessions of EOC training and re-qualification occurred during September. All EOC personnel are expected to re-qualify once per year. In addition, a new system of documentation is being introduced into the EOC which allows easier and faster access to relevant ‘incident’

information within the EOC. The system also establishes a 'paper trail' which can be used to evaluate EOC effectiveness. (Jeff French, Jerry Crescenti, Neil Hukari)

Community Monitoring Stations

Community monitoring station meteorological towers at Blackfoot and Rexburg have had the old sensors removed and replaced with our standard suite of meteorological sensors. These two stations are now operating on the INEEL Mesoscale Meteorological Network (mesonet). Datalogger software has been developed and is currently being tested to operate the existing large signs that allow the public to view current meteorological conditions as they walk or drive by the two schools. (Roger.Carter@noaa.gov, Randy Johnson, Tom Strong, Kirk Clawson)

Other Activities

Mesonet Database

Changes were made to the FRD web site to include access to our 3 year mesonet database. Data for any 5 minute period can now be displayed for all stations and their associated met parameters. The link to this data can be found at http://www.noaa.inel.gov/weather under the heading Historical 5 minute data. (Brad Reese)

INEEL Network

The Department of Energy's INEEL network was shut down for several days during September after hundreds of computers were infected by the Code Red II virus. Because FRD's network is a sub-node on the larger INEEL network, we were also shut down and without internet access for over a week. All systems had to be scanned for infection before being brought on-line. No viruses were found on FRD computers and we were allowed back on-line. Because of this incident we are now investigating alternative approaches for accessing the internet. (Brad Reese)

Papers

Clawson, K. L., R. G. Carter, B. R. Reese, R. C. Johnson, N. F. Hukari, and D. J. Lacroix., 2001: Gauntlet SF_6 Atmospheric Tracer Release, and Field Test Support. NOAA Technical Memorandum OAR ARL-240, Silver Spring, MD, 340 pp.

Crescenti, G. H., J. R. French, T. L. Crawford, and D. C. Vandemark, 2002: An integrated airborne measurement system for the determination of atmospheric turbulence and ocean surface wave field properties. Preprint, *Sixth Symposium on Integrated Observing Systems*, Orlando, FL, Jan. 13-17, Amer. Meteor. Soc., paper P1.11.

Travel

Kirk Clawson traveled to Salt Lake City, Utah from September 10-13, 2001, to attend a VTMX/URBAN 2000 workshop.

Awards

Roger Carter received the award for ARL paper of the year for the following journal article:

Carter, R. G., and R. E. Keislar, 2000: Emergency response transport forecasting using historical wind field pattern matching. *Journal of Applied Meteorology*, **39**, 446-462.